

WHAT IS CLAIMED IS:

1. A method of fabricating a semiconductor device comprising steps of:

5 forming a silicon layer to be in contact with at least either the upper surface or the lower surface of a first film having a contact angle of not more than about 45° with respect to molten silicon; and

10 crystallizing said silicon layer after melting said silicon layer by heating said silicon layer with a continuously oscillated electromagnetic wave.

2. The method of fabricating a semiconductor device according to claim 1, wherein

15 said first film has a smaller contact angle with respect to molten silicon than a silicon oxide film.

3. The method of fabricating a semiconductor device according to claim 2, wherein

20 said first film includes at least either an SiN_x film or an SiCN film having a contact angle of not more than about 45° with respect to molten silicon.

25 4. The method of fabricating a semiconductor device according to claim 2, wherein

said first film includes an SiC film.

5. The method of fabricating a semiconductor device according to claim 1, wherein

5 said step of crystallizing said silicon layer includes a step of forming an absorption film either above or under said silicon layer through an insulating layer, and a step of applying a continuous-wave laser beam to said absorption film thereby making said absorption film 10 generate heat and crystallizing said silicon layer through generated said heat.

6. The method of fabricating a semiconductor device according to claim 5, wherein

15 said continuous-wave laser beam includes an infrared laser beam having a wavelength of at least about 0.75 μm and not more than about 2.0 μm .

20 7. The method of fabricating a semiconductor device according to claim 6, wherein

 said continuous-wave laser beam includes a continuous-wave YAG laser beam.

25 8. The method of fabricating a semiconductor device according to claim 5, wherein

said absorption film consists of a material including
Mo.

9. The method of fabricating a semiconductor device
5 according to claim 5, further comprising a step of forming
a gate electrode by patterning said absorption film after
said step of forming said absorption film.

10. The method of fabricating a semiconductor device
according to claim 5, wherein

 said step of forming said absorption film includes a
step of previously patterning said absorption film to be
employable as a light-shielding film for a pixel part of a
display.

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11. The method of fabricating a semiconductor device
according to claim 10, wherein

 said step of previously patterning said absorption
film to be employable as a light-shielding film for a
20 pixel part of a display includes a step of patterning said
absorption film in the form of a matrix.

12. The method of fabricating a semiconductor device
according to claim 1, wherein

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 said step of crystallizing said silicon layer

includes a step of heating said silicon layer with a fundamental wave of said continuous-wave laser beam.

13. The method of fabricating a semiconductor device
5 according to claim 1, wherein

said step of forming said silicon layer includes a step of forming said silicon layer to be in contact with the upper surface of said first film,

10 said method of fabricating a semiconductor device further comprising a step of forming said first film on a substrate through a buffer layer for relaxing heat transfer to said substrate in advance of formation of said silicon layer.

15 14. The method of fabricating a semiconductor device according to claim 13, wherein

said buffer layer includes a silicon oxide film.

15. The method of fabricating a semiconductor device
20 according to claim 1, further comprising steps of:

forming a source/drain region on said silicon layer by implanting an impurity into said silicon layer, and activating said impurity in said source/drain region with said continuously oscillated electromagnetic wave.

16. The method of fabricating a semiconductor device according to claim 15, further including a step of forming a patterned gate electrode on said silicon layer in advance of said step of forming said source/drain region 5 on said silicon layer.

17. The method of fabricating a semiconductor device according to claim 15, further including a step of applying a bias voltage between either said source or 10 drain region of said silicon layer and said absorption film.

18. The method of fabricating a semiconductor device according to claim 1, further comprising a step of forming 15 roughness on the surface of said first film to be formed with said silicon layer in advance of said step of forming said silicon layer.

19. The method of fabricating a semiconductor device 20 according to claim 18, wherein

 said step of forming said roughness includes a step of forming said roughness on the surface of said first film by etching the surface of said first film.

25 20. The method of fabricating a semiconductor device

according to claim 1, wherein

 said first film having said contact angle of not more
 than about 45° with respect to molten silicon is an SiN_x
 film formed by plasma CVD.

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21. The method of fabricating a semiconductor device
according to claim 20, wherein

 said SiN_x film is formed by plasma CVD while setting
 the flow ratios of SiH₄ gas, NH₃ gas and N₂ gas to 2:1:100
10 to 2:2:100.